ing up to date such a mass of data, it is scarcely satisfactory that an appendix of thirty-seven pages should be required to a text of 471 pages; even this does not suffice, and thirteen further pages of additions and corrections are called for. In the list of literature given on p. 520, which presumably represents that consulted, we do not find the *Mineralogical Magazine.* The fact that the appendix contains data which appeared in that journal no fewer than ten years ago suggests that the author did not till the eleventh hour become aware of the work which had been done in this country.

MICROSCOPIC ANATOMY.

Text-book of Microscopic Anatomy. By Prof. E. A. Schäfer, F.R.S. Pp. xiv + 739. ("Quain's Elements of Anatomy." Eleventh edition. Editors: Prof. E. A. Schäfer, F.R.S., Prof. J. Symington, F.R.S., and Prof. T. H. Bryce. In four volumes. Vol. ii, Part i.). (London: Longmans, Green and Co., 1912.) Price 25*s.* net.

IT is with very mixed feelings that the anatomist will contemplate this new part of the eleventh edition of the so-called "Quain's Elements of Anatomy." Since the last edition appeared this part has tripled its size, quadrupled its illustrations, and attained the dignity expressed in its subsidiary title, "Text-book of Microscopic Anatomy"; and both the author and the publishers are to be congratulated on the wealth and beauty of its illustration, even though so many of them have been borrowed from familiar text-books. One might perhaps have wished for fuller information in regard to certain tissues, such, for example, as the Purkinje-fibres of the heart; but considered as a whole it is the standard work on microscopic anatomy in our language.

The chief criticism one feels bound to make arises from the very excellence of the work, which, by helping to stereotype a stupid subdivision of anatomy into gross, microscopic, and fœtal, will hinder that reform in anatomical teaching which is felt to be urgent by the leading teachers throughout the world. By continuing to cut asunder and put into separate volumes the information concerning the structure of the body that can be acquired by examination respectively with and without the help of a lens, or a system of lenses, the editors are perpetuating a drag on medical education that is fraught with infinite harm both to students and teachers. Moreover, the developmental history, the chief use of a knowledge of which is to explain the complexities of the adult structure and its variations, is also separated from the rest. The editors of "Quain" missed a great opportunity when they declined to take part in this reform of anatomical teaching which is now in active progress; and I believe they have in some measure lessened the value of this famous book, if they have not intensified the forces of reaction, by refusing to move with the times.

One might also have expected on the part of the distinguished physiologist who has written this treatise on anatomy fuller reference to the functional significance of the organs and tissues under consideration, which obviously plays so large a part in determining their structure.

A more serious attempt has been made in this volume to supply a bibliography than was the case in the other volumes issued; and for this reason, as well as for its greater accuracy of statement and quotation, this part is likely to be used more widely as a work of reference.

G. E. S.

MECHANICS AND THEORETICAL PHYSICS.

(1) *Theoretische Mechanik.* By Prof. Robert Marcolongo. Autorisierte deutsche Bearbeitung von Prof. H. E. Timerding. Zweiter Band: "Dynamik und Mechanik der deformierbaren Körper." Pp. vii + 344. (Leipzig and Berlin: B. G. Teubner, 1912.) Price 10 marks.

(2) *The Practical Science of Billiards and its "Pointer."* By Col. C. M. Western. Pp. iv + 153. (London: Simpkin, Marshall and Co., Ltd., 1911.) Price 3*s.* 6*d.* net.

(3) *Physical Significance of Entropy or of the Second Law.* By Prof. J. F. Klein. Pp. xx + 98. (New York: D. Van Nostrand Co., 1910.) Price 1.50 dollars net.

(4) *Populär-wissenschaftliche Vorlesungen.* By Prof. E. Mach. Vierte Auflage. Pp. vii + 568. (Leipzig: J. Ambrosius Barth, 1910.) Price 6.80 marks, or 7.50 marks bound.

(5) *Thermodynamique et Chimie.* By Prof. Pierre Duhem. Seconde Édition. Pp. xii + 580. (Paris: A. Hermann et Fils., 1910.) Price 16 francs.

(6) *Kant's gesammelte Schriften.* Herausgegeben von der K. Preuss. Akad. der Wissenschaften. Band xiv. Pp. lxii + 638. (Berlin: Georg Reimer, 1911.) Price 19 marks.

(1) THE feature to which objection was taken in the review of the first volume of Marcolongo and Timerding's "Theoretical Mechanics" (the advanced character of the early portions and the elementary character of the later ones) is not shared by the second volume. It

deals with particle and rigid dynamics, theory of the potential, analysis of stress and strain, and the equations of hydrodynamics. This book, therefore, belongs to a class, of which we have seen previous examples, in which it is sought to condense into one volume the fundamental principles of several portions of applied mathematics, the detailed study of each of which would occupy a volume to itself. As Dr. Timerding points out, this necessitated careful pruning down of the subject-matter, and he expresses the hope that the selection will suffice for the object in view. The kind of reader who will really profit by a book of this character is the student of modern physics who requires to acquire this particular knowledge in his undergraduate days, and who subsequently proposes a course of training in research. For him the book should be very useful.

(2) It would have been a great improvement if Col. Western had arranged for a few hours' coaching with a modern graduate in mathematics or physics before attempting to enlighten the public on the practical *science* of billiards. His graphical constructions for the deviation of a billiard ball after impact are all right, but it would have been greatly conducive to lucidity if he had explained the dependence of the result on the coefficient of restitution. A more serious defect is that the author speaks of the "forces of a ball" when that ball may be moving with uniform velocity in a straight line. This is a misuse of the term "force" which is quite unnecessary, and calculated to prejudice the scientific reader against the book. The author's explanation of the curved path of a ball on p. 75 is also on the face of it unsound. Nevertheless, he claims to have invented a "pointer," which enables a beginner to find where to place his balls, and where to aim when attempting any particular stroke, and this appears to be correct in principle, and to enable allowances to be made for differences in strength or mode of playing, as well as for other factors which may affect the result.

(3) In "The Physical Significance of Entropy" Prof. J. F. Klein has attempted to present the general conclusions arising from the investigations of Boltzmann and Planck, the former dealing mainly with molecular systems, and the latter with radiation phenomena. Planck's treatise was reviewed some time ago in NATURE. The particular aspect of the problem here dealt with is the connection of the second law with probability considerations. In separating the conclusions from their analytical proofs, Prof. Klein has given the unmathematical reader a statement of results which he must accept on the authority of Boltzmann and Planck unless he is prepared to study up the original difficult mathematical investigations. The trouble is that these books fall into the hands of readers with whom a little knowledge is a dangerous thing, and who without troubling to study the matter thoroughly rush into print with theories of their own, in which the most conspicuous feature is the flagrant misuse of elementary physical terms.

Although these statistical considerations have certainly been successfully applied to the interpretation of current physical events, it must not be forgotten that they possess one important difficulty. While the theory of probability shows that the entropy of a system tends to a maximum, the same arguments appear to indicate the extreme improbability that the entropy should ever deviate from this maximum, and we are thus required to postulate an initial state of the universe, the improbability of which becomes increasingly difficult to understand as we go further and further back in the scale of time.

It should be stated that Prof. Klein makes no claims to originality, and his book is well suited to specialists in other branches of science who want to know the gist of what has been done in this particular subject.

In connection with this review, mention may be made of a recent paper by Planck in the *Annalen der Physik,* 37 (1912), on the foundation of the law of black-body radiation, in which the statistical method is again employed.

(4) Prof. E. Mach's "Popular Scientific Lectures" is a miscellaneous collection of twenty-six articles averaging rather under twenty pages in length, dealing with varied questions in physics, philosophy, physiology, and psychology, and including music, photographs of flying bullets, binocular vision, space and time, relative value of different educational studies, elements of electrostatics, energy and entropy, and other subjects equally diverse in character. It is the kind of book to be read in leisure half-hours by a business man who is interested in science but has no time for extended study. Under "symmetry in music" we notice an interesting experiment which may easily be reproduced by reversing a music-roll and playing it with the bass end towards the treble.

(5) It would be unnecessary to refer in detail to the latest edition of Prof. Duhem's "Thermodynamics and Chemistry," since this work has now become a recognised text-book, and the English translation, which appeared in 1903, is largely read both in this country and in America. Since the first edition science has lost Willard Gibbs, Van der Waals, and Bakhuis Roozeboom;

on the other hand, the work on metallic alloys by Gustav Tammann and several other investigations, including a discussion of quadrivariant systems by Schreinmakers and De Baat, are new, and are included in this volume. Another change that has been gradually taking place has been the growing importance attached to the phase rule and its applications in the chemical industry, where many firms employ experts engaged in making theoretical calculations and not experiments only.

(6) Volume 14 of Kant's collected works, issued under the auspices of the Prussian Academy of Sciences, is the first of a new series dealing with Kant's manuscript relics. The first thirteen volumes comprise Kant's principal works and correspondence, and this volume includes all those minor writings which refer to mathematics, physics, chemistry, and physical geography. A few of these, notably the mathematical ones, are what an examiner would describe as "rough work," and the editor has evidently been at much trouble to interpret some of the fragments in the copious notes which go far to make up the bulk of the volume.

OUR BOOKSHELF.

The Calorific Power of Gas: a Treatise on Calorific Standards and Calorimetry. By J. H. Coste. Pp. xvi+310. (London: C. Griffin and Co., Ltd., 1911.) Price 6*s*. net.

AN increasing proportion of coal-gas now manufactured is used for heating and power purposes, in which the value of the gas is directly measured by its calorific value. Of the gas used for lighting, the bulk of it is now burnt with incandescent mantles, and for this purpose the calorific value is a better measure of value than the direct photometric candle-power with an Argand burner. Hence the methods of measuring the calorific value of gas have assumed practical importance, and the present book supplies a distinct need.

Gas supply being in this country a practical monopoly, and the gas consumer being unable to gauge the quality of the gas supplied to him, from a very early date the testing of gas has been subject to statutory regulation, and in the opening chapters a clear and concise account is given of gas legislation. The relation between the present photometric standards and the equivalent calorific standards is then dealt with, and this is followed by a discussion of the changes in the mode of gas manufacture during the last sixty years as affecting the lighting and heating values. Then follow descriptions of the construction and mode of working of a considerable number of gas calorimeters of different types, special attention being given to those which have been most generally adopted.

The author has had practical acquaintance with all the types of instruments in general use, and gives the results of his experience, in many cases not previously published. The discussion on the sources of error affecting the results of flow calorimeters is especially valuable, as is also the account of the various "net values" which have been proposed.

The work will be highly appreciated by gas engineers, gas examiners, and everyone concerned with the manufacture or testing of coal gas.

Catalogue of the Chiroptera in the Collection of the British Museum. Second edition. By Knud Andersen. Vol. i., "Megachiroptera." Pp. ci+854. (London: Printed by Order of the Trustees. Sold by Longmans and Co.; B. Quaritch, Dulau and Co., Ltd.; and at the British Museum (Natural History), 1912.) Price 2*l*. 10*s*.

THE present account of the Megachiroptera, although nominally a new edition of Dobson's Catalogue published in 1878, is in reality an original monograph, and the trustees of the British Museum have been fortunate in securing for this work the services of Dr. Knud Andersen, whose name alone is sufficient guarantee for a careful and accurate revision of the group.

In the introduction will be found a detailed discussion of the general characters, the interrelations of the genera, the geographical distribution, and a synopsis and key, the latter based on dental and cranial characters only.

The body of the work consists of new descriptions of 228 forms, and the subject-matter is divided for convenience of reference into specially marked paragraphs. The technical names are throughout fixed in strict accordance with the laws of priority.

The work appears to have been extremely well done, and the author and Mr. Oldfield Thomas, without whose support it could not have been attempted, deserve very warm congratulations on the appearance of vol. i., and good wishes for the completion of the whole catalogue.

The illustrations have been entrusted to A. J. Engel Terzi, and appear to be very satisfactory.

Icones Plantarum Formosanarum nec non et Contributiones ad Floram Formosanam; or, Icones of the Plants of Formosa, and Materials for a Flora of the Island, based on a Study of the Collections of the Botanical Survey of the Government of Formosa. By B. Hayata. Fasciculus i. Pp. iii+265+xl plates. (Taihoku: Published by the Bureau of Productive Industry, Government of Formosa, 1911.)

PREVIOUS to 1897, when the Japanese took possession of Formosa, the botanical exploration of the island was almost entirely due to British enterprise, but the savage inhabitants had prevented travellers from penetrating the mountainous interior. Since their occupation the Japanese have been very active in the investigation of the natural products, and botanists have not been the least active. The botanical literature